REMARKS

The Examiner has examined claims 1, 4, 5, 13, 15, and 24. All other claims have been withdrawn due to an election of species requirement.

Of the examined claims, claims 1, 13 and 24 are independent claims.

§ 103(a) Rejection – Lee, Ide

Claims 1, 13, and 24 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 7,095,393 (Lee) in view of U.S. Patent 6,753,831 (Ide). Applicants respectfully traverse this rejection.

Applicants submit that Lee and Ide fail to teach at least one claimed element.

With respect to claim 1, the Office Action alleges that Lee discloses a liquid crystal display apparatus that corrects optical response characteristics of a liquid crystal display panel, comprising "signal type detection section," and "enhancing conversion section." (Office Action at paragraph bridging pages 4-5). With regard to the enhancing conversion section, the Office Action refers to Fig. 9 of Lee, and associated disclosure at column 13, lines 11-24. However, the Office Action also indicates that Lee does not teach the claimed "signal type detection section" and the claimed "I/P conversion section." (Office Action at paragraph bottom of page 5).

Instead, the Office Action relies on Ide for teaching the claimed "signal type detection section" and" I/P conversion section." (Office Action at paragraph bridging pages 5-6).

Thus, as indicated in the Office Action, Lee fails to teach an enhancing conversion section for an LCD in the case where the signal type is an interlace signal. Applicants submit that Ide fails to make up for at least this deficiency.

The present application provides solutions to problems that occur in a liquid crystal display (LCD). LCD's are a type of display device in which a desired image is reproduced by controlling the intensity of light by adjusting the electric field in accordance with image data

supplied to a part where a scanning line intersects with a signal line. The liquid crystal at the part where the scanning line intersects with a signal line is typically driven by a thin film transistor that is a non-linear element. LCD's cannot easily support moving images on account of a slow response speed. (see "Background").

With respect to the Ide reference, the Office Action states:

> "That IDE goes on to describe particular steps and structure to mitigate problems caused by the noise of a plasma display does not detract from the teachings available for LCDs."

Applicants submit that although Ide mentions LCDs as a type of display, it addresses problems with respect to a plasma display. The problems addressed by the present application are particular to LCD's.

The Office Action further alleges that overshoot is not mentioned in the claims. Subsequently, in order to explicitly indicate that enhancing conversion in a direction of gray level transition is a definition of overshoot, Applicants have amended the claims to include the term overshoot as well as the definition. Applicants submit that Ide does not disclose overshoot in an LCD.

Applicants submit that because Ide discloses I/P conversion without overdrive and Lee discloses overdrive without I/P conversion, and the present application covers problems with using the combination of I/P conversion and overdrive, that the references, either alone or in combination, fail to disclose either the problem or solution addressed by the present application.

The Office Action concludes that it would have been obvious to combine Lee and Ide to obtain the present invention, because it would provide advantages such as signal processing appropriate to the signal type. Applicants submit that simply combining the I/P conversion of Ide and the LCD of Lee will still not result in all elements of the claimed invention.

As disclosed in the present application, Applicants have determined that enhancing conversion performed in an LCD for progressive scan signals as an overshoot drive amplifies

image quality problems when performed in the LCD for interlaced video signals converted using I/P conversion. Applicants have found that an overshoot drive makes problems such as flicker noise and oblique lines appearing as a series of light and dark lines (jaggies) worse. (specification at page 9, with respect to Fig. 21).

On the other hand, in an LCD displaying moving images, a halftone cannot be reproduced within one frame period, resulting in an afterimage. (specification at page 8, lines 1-7).

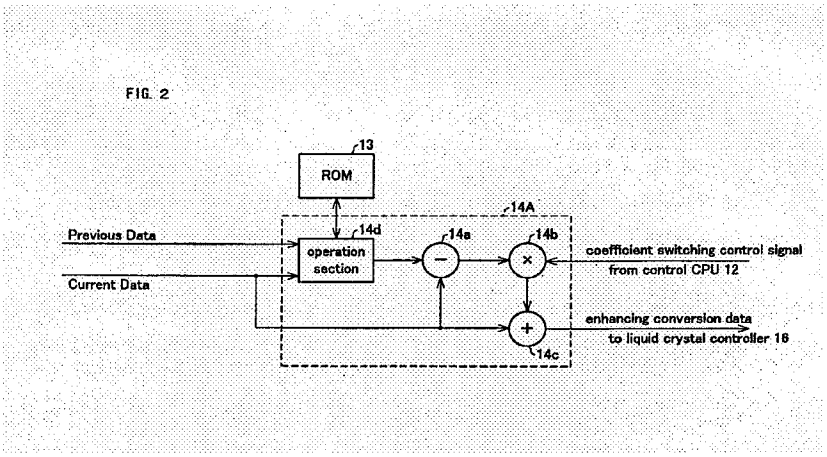
Subsequently, the present invention seeks a solution that balances contradictory goals of high quality display of moving images provided either input of a progressive scan signal or an interlace signal on an LCD apparatus.

As disclosed in the present application at pages 28-29,

> The liquid crystal display apparatus of Embodiment 1 shown in Fig. 1 is arranged as follows: while no conversion is carried out when input image data is a progressive signal, the input image data is, when the input image data is an interlace signal, subjected to the I/P conversion so as to be converted to a progressive signal. In any case, the enhancing conversion is further performed with respect to the image data, in order to improve the optical response speed of a liquid crystal display panel. On the occasion of the enhancing conversion, furthermore, the degree of the enhancing conversion with respect to the image data having been subjected to I/P conversion is caused to be lower than the degree in a case where the input image data is a progressive signal by nature.

Subsequently, embodiments of the present invention restrain the deterioration of image quality on account of a false signal occurring at the outline of the image on the occasion of subjecting an interlace signal to the I/P conversion. (Office Action at page 39).

In particular, in embodiments of the present invention, the enhancing conversion section 14A (see Fig. 2) performs enhancing conversion with respect to the input image data, for both interlace video signal and progressive video signal.



In performing enhancing conversion, the **operation section 14d** compares input image data (current data) of M-th frame to be displayed next with input image data (previous data) of (M-1)-th frame, which has been stored in the frame memory 15. Then the OS parameter corresponding to the result of the comparison (i.e. gray level transition) is read out from the **OS table memory (ROM) 13**, so that the enhancing operation data is obtained. The **subtracter 14a** calculates the difference data indicating the difference between the aforesaid enhancing operation data and the input image data of the M-th frame to be displayed next.

The **multiplier 14b** multiplies the difference data by a multiplication coefficient $\alpha 1$, then the **adder 14c** adds the multiplied data to the input image data of the M-th frame to be displayed, and consequently, as enhancing conversion data, the data as a result of the addition is supplied to the liquid crystal controller 16.

In an embodiment of the present application, when the video type detecting section detects a progressive signal, a multiplication coefficient $\alpha 1 = 1$ is used by multiplier 14b in performing the enhancing operation (specification at page 35). When the video type detecting section detects an interlace signal, the interlace signal is converted to a pseudo-progressive signal (specification at page 36, bottom paragraph), and a multiplication coefficient $\beta 1$ is used by multiplier 14b.

Subsequently, the enhancing conversion data, which is supplied to the liquid crystal display panel 17, has a degree of enhancing conversion lower than that of the enhancing operation data figured out by the operation section 14d. (specification at paragraph bridging pages 37-38).

In an alternative embodiment, an OS table is provided for interlaced signals (13b) and progressive signals (13a).

Claims 1, 13, and 24 have been amended based on the disclosed feature of the enhancing conversion section with respect to an interlace signal.

Applicants submit that Lee's disclosure of a modification parameter input unit 444 provides a finer set of levels than the disclosed conventional example shown in present Figs. 15-18, and described in the "Background" of the present application. The conventional example shows four levels to cover ranges of temperatures. Lee supports calculation of a modification LUT for a specific temperature.

According to Lee, Fig. 9 and associated disclosure at column 13, lines 11-24, discloses a modification parameter input unit 444 that receives parameters for determining how many modifications of the gray signal will be performed, selecting a LUT, and changing compensation values of the selected LUT, and provides the same to the LUT selector 445. According to Lee, parameters that can be input to the modification parameter input unit 444 include temperature data from a sensor for measuring the present temperature of the LCD, image quality selecting data according to a user's taste, and environment data (whether the LCD displays static or moving graphics). A LUT converter 446 obtains a compensation value of a LUT suitable for a measured temperature and modifies the values of a LUT to obtain a modification LUT 442 (bottom paragraph col. 13).

Applicants submit that the finer set of levels may enable finer enhancing conversion for a range of a modification parameter such as temperature. However, Lees' modification parameter input unit 444 does not teach enhancing conversion that is dependent on the signal type of image data, i.e., progressive scan signal vs. interlace scan signal.

At least for these reasons, Applicants submit that Lee and Ide, either alone or in combination, fail to disclose at least the claimed feature of

"when the enhancing conversion section subjects the quasi-progressive signal to the overshoot enhancing conversion in accordance with a result of detection performed by the signal type detection section, the enhancing conversion section performs such enhancing conversion that when the input image data is an interlace signal, the degree of the enhancing conversion of the image data is lower than when the input image data is a progressive signal."

A similar feature is recited in claims 13 and 24.

Accordingly, Applicants request that the rejection be reconsidered and withdrawn.

§ 103(a) Rejection – Lee, Ide, Nitta

Claims 4, 5, and 15 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee, Ide, and further in view of JP 2003-143556 (Nitta; provided with an IDS). Applicants respectfully traverse this rejection.

The same deficiencies as in the above for claim 1 apply as well to claims 4, 5, and 15. For at least the reasons above for claim 1, Applicants submit that the rejection fails to establish *prima facie* obviousness for claims 4, 5, and 15, as well.

Furthermore, Nitta fails to make up for the above-stated deficiencies in Lee and Ide.

Nitta discloses, in a display device which performs interlace/non-interlace conversion and overdrive processing, a liquid crystal display control for a high-definition movie with low pass by using a memory for the conversion and overdrive processing (see para. 0007).

However, Nitta does not disclose the problem with the overshoot drive when a signal type of input image data is an interlace signal and the interlace signal is converted to a progressive signal, I/P conversion.

Instead, in Nitta, when overdrive processing (which corresponds to the overshoot processing of the present invention) produces a drawback, the overdrive processing is not

allowed (see, for example, claim 8). Therefore, if the interlace signal is converted to the progressive signal, the overshoot processing is not performed for a progressive signal that is converted from the interlace signal. Thus, Nitta does not make up for the deficiencies in Ide and Lee.

The Office Action address this argument as though a teaching that overdrive processing is not allowed means that Nitta teaches overdrive processing that has been reduced to zero.

However, in the claimed invention, the enhancing conversion is performed in either case including when the input image data is an interlace signal.

The present invention solves a problem that occurs when the interlace signal is converted to the progress signal and the overshoot drive is performed, as well as eliminates problems such as afterimage. Applicants submit that even provided the combination of Lee, Ide, and Nitta, the present invention would not have been obvious at the time of the invention.

Applicants request that the rejection be reconsidered and withdrawn.

CONCLUSION

In view of the above Amendment, Applicants believe the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact **Robert Downs** Reg. No. 48,222 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

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Respectfully submitted,

By Robert Downe #48222

Michael R. Cammarata
Registration No.: 39,491
BIRCH, STEWART, KOLASCH & BIRCH, LLP
8110 Gatehouse Road
Suite 100 East
P.O. Box 747
Falls Church, Virginia 22040-0747
(703) 205-8000
Attorney for Applicants